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IMPROVING CONSUMER SATISFACTION BY INTEGRATING ON SERVICE QUALITY AND LEAN SIX SIGMA METHODS

Neneng Leni Noviani[a], Masyhudzulhak[b]

[a]Faculty of Management, Universitas Jayabaya, Indonesia,
Email: neneng_noviani@yahoo.com
[b]Faculty of Management, Universitas Jayabaya, Indonesia,
Email: masyhudzulhak@gmail.com

Abstract

Service quality (SERVQUAL) is one method that can be used to measure customer satisfaction for services that have been received that is by comparing the level of perception and expectations. Lean, six sigma is a method or technique for controlling and improving the quality of which is a dramatic breakthrough in the field of quality and is always oriented to customer satisfaction with a measurement target of sigma quality level. Integration SERVQUAL and Lean Six Sigma methods aims to SERVQUAL measurement results were analysed is to determine the critical variables, followed by calculation of DPMO and sigma value of the critical variables that can be known variables that priority improvements

Keywords: SERVQUAL, Lean, Six Sigma, Customer Satisfaction

INTRODUCTION

Quality control is key in maintaining customer loyalty. Quality of service is the ability of an organization in meeting consumer expectations (Parasuramant et al., 1988; Kandampully, 1998; Zeithaml et al., 1988), and the quality of service is a mismatch between consumer expectations and consumer perceptions (Berry et al., 1990; Hill, 1995). Six sigma is a set of tools used to identify, analyse, and eliminate sources of variation in the process (Antony, 2006; Raisinghani, 2005).

Consumer satisfaction is one of the keys for the company to improve its quality (Andreassen and Lindestad, 1998; Lee et al., 2000; Anderson et al., 1994). Consumer satisfaction is the consumer's sense of the service they receive from the company that gave it (Parasuramant et al., 1988; Bowen, 1986; Zeithaml et al., 1996; Parasuramant et al., 1991), where consumer satisfaction is the most important factor in developing processes and building relationships with consumers (Gwinner et al., 1998; Sweeney and Soutar, 2001). Two main perspectives in measuring service quality are internal perspectives and external perspectives (Kang et al., 2002; Marshall et al., 1998; Grönroos, 1984; Wong and Sohal, 2003). External perspectives to know about consumers, change what consumers feel and develop consumer expectations and understand the aspects such as consumer perceptions, consumer expectations, consumer satisfaction, behavior and consumer pleasure (Sachdev and Verma, 2004).

To measure consumer satisfaction used SERVQUAL method. According to Dyke et al. (1997), SERVQUAL is a method for measuring the service quality of a service provider. Service quality is measured from each dimension by calculating the variable G (gap), which illustrates the difference between consumer perceptions and customer expectations of the services provided (Jiang et al., 2002).

This research designs integrated system between SERVQUAL, lean and six sigma methods to develop service improvement method aimed to improve the quality of existing service so that it is expected to increase consumer's satisfaction on the services provided.

LITERATURE REVIEW

Consumer Satisfaction

Consumer satisfaction is feeling of pleasure or disappointment of a person derived from the comparison between performance (or outcome) impression of a product and its expectations (Prayag et al., 2013; Woodruff et al., 1983). Several ways to measure satisfaction consumer, first, *customer-centric*, an extensive opportunity for its customers to submit suggestions and complaints (Parvatiyar and Sheth, 2001; Galbraith, 2005), and second, *customer satisfaction survey*, through the survey the company will get feedback and feedback directly from customers and also provide positive signals that the company is paying attention to its customers (Zeithaml et al., 2002).

The higher the level of quality given the company to the customer, the higher the level of fulfilment of customer needs are usually expressed by the level of customer satisfaction. But if there is a gap between the level of quality provided by the company to the actual needs of customers, then there will be a problem of customer dissatisfaction which is a quality problem that must be resolved by the company, it can lead to loss of customers owned by the company. By knowing the customer satisfaction then the goods or services that the production of a manufacturer has more value because the more desirable consumers as users of the product.

Service Quality

Service quality is now an increasingly important priority for companies that want to have a difference from companies in their environment. The company's decision to undertake systematic service improvement actions is the decisive protector in following up consumer complaints from a failure that ultimately ties consumer loyalty (Berry and Parasuramant, 1997). Simply put, service quality can be interpreted as a "measure of customer expectations" (Wisniewski, 2001). Based on this definition, the quality of service is determined by the ability of the company to meet customer needs and desires in accordance with customer expectations.

To create a high quality of service, a company must offer services that customers can accept or perceive to suit or exceed what customers expect. The higher the quality of service perceived by customers than the expectations, customers will be more satisfied (Zhao et al., 2012). Quality of service is the level of excellence (excellence) is expected and control over these advantages to meet customer desires (Hussain, et al., 2014). While Gronroos (1988) argue that quality should start from customer needs and end in customer perception. This means that a good quality image is not based on the perspective or perception of the service provider, but on the customer's perspective or perception. Customers who consume and enjoy the services of the company, so they should determine the quality of services.

In the context of service quality and satisfaction according to customer perception, it has been reached consensus that customer expectation has big role as standard of comparison in evaluation of quality and customer satisfaction because consumer decision to buy service offered by service company depends from consumer appraisal to service produced with which are expected. If the quality of services provided satisfactory then this is very affect consumers to buy back the service and vice versa.

Commitment to the quality of customer-oriented services is one of the main factors in supporting the success of a business, especially in the service industry. This is due to the quality of services depends on who and how the services are provided. The success of a service industry is highly dependent on consumer ratings, it is very important to pay attention to customer satisfaction. Zeithaml et al. (1988) has undertaken various studies of some services, and successfully identified five dimensions of characteristics used by customers in evaluating service quality. This method is known as SERVQUAL with five observed service dimensions known as Q-RATER, (a) responsiveness; (b) assurance; (c) tangible; (d) empathy and; (e) reliability.

Lean Six Sigma

Lean is an ongoing effort to eliminate waste and increase the value added of products (goods and or services) to deliver value to customers (Liker and Morgan, 2006). The goal of Lean is to continually improve customer value through the continuous improvement of the value-to-waste ratio (May, 2005). Lean focuses on the identification and elimination of non-value adding activities in design, production (for

manufacturing) or the field of operations (for services) and supply chain management that is directly related to the customer.

Six Sigma is a continuous effort to reduce waste, reduce variance and prevent defects (Feo, Z Bar-El., 2002). Six Sigma is a business concept that strives to answer customer demand for the best quality and flawless business processes (Rylander and Provost, 2006). Customer satisfaction and improvement are the highest priority, and Six Sigma seeks to eliminate the uncertainty of achieving business goals.

Six sigma can be explained in two perspectives, namely the statistical perspective and the perspective of methodology/management philosophy. Sigma in statistics is known as the standard deviation that expresses the deviation value to the mean value (Bates et al., 2015). A process is said to be good when it runs at an agreed range. the range has a limit, upper limit or USL (Upper Specification Limit) and a lower limit or LSL (Lower Specification Limit) process that occurs outside the range is called a defect (Corbett and Pan, 2002). Six sigma processes are a process that only produces 3.4 DPMO (defect per million opportunity), six sigma implementation strategy created by Harry and Schroeder are referred to as the six sigma breakthrough strategy (Harry, 1998). This strategy is a systematic method that uses data collection and statistical analysis to determine sources of variation and ways to eliminate it.

Six sigma is an activity undertaken by all members of the company that become culturally and in accordance with the vision and mission of the company, the goal is to improve business process efficiency and satisfy customer desires, thereby increasing the value of the company (Pyzdek and Keller, 2010).

RESEARCH METHODOLOGY

Sampling Design

The population in this study are all companies in Indonesia who use General Electric generating machinery and the existence of long-term contract service (CSA) with PT. GE Energy. The sampling of this study is internal and external employees responsible and associated with long-term contract work between consumer companies using General Electric engines with GE Energy. Respondents external to the sampling of the respondents in charge of the Procurement/Purchasing, Warehouse, Technical Section, Finance Department with a total of 51 employees.

Research Procedure

At this stage, gaps obtained from the questionnaire that has been spread to respondents. Respondents here are GE Energy customers who already have long term counter. 53 questionnaires scattered, used for data processing were 51 questionnaires. The data processing of questionnaires distribution begins with identifying respondent data, identifying the level of importance that will be used for weighting, identification of expectation value and consumer perceptions of services provided by GE Energy.

Then tested the validity and reliability of the data from the level of importance, expectation value and consumer perceptions of the services provided, and identified the gap values of dimensions, calculated the gap value without weighting and calculated the weighted gap value. After that done improvement based on attributes that have the biggest negative value as a priority improvement.

DATA ANALYSIS

Value at the level of importance is used to weight the value of SERVQUAL and to get priority improvement based on the largest negative gap value. The attribute that has the highest average importance means that the attribute according to the consumer is very important to increase the perceived satisfaction on the result of the service received, that is the attribute of accuracy in the delivery of spare parts, in accordance with the demand contained in the dimension of reliability with the value of 0.043186.

Each attribute on the questionnaire of importance, consumer perceptions of the service it receives, and the consumer's expectation of the service to be received from R Table = 0,228.

Table 1: Test Reliability

Item	R Table	Alpha
Interest	0,228	09,015
Perception	0,228	09,407
Expectation	0,228	09,522

Table 2: Unweighted Gap Value

Dimensions	Perception	Expectation	Unweighted SERVQUAL value	Priority Improvement
		Tangible		
T1	3.601	4.353	-0.752	21
T2	3.419	4.238	-0.819	18
T3	3.238	4.061	-0.823	16
T4	3.716	4.389	-0.673	25
T5	3.434	4.292	-0.858	14
T6	3.65	4.36	-0.71	24
T7	3.65	4.39	-0.74	22
	24.708	30.083	-5.375	
		Reliability		
Rel.1	3.46	4.28	-0.82	17
Rel.2	3.5	4.27	-0.77	20
Rel.3	3.43	4.36	-0.93	7
Rel.4	3.35	4.46	-1.12	1
Rel.5	3.6	4.34	-0.74	23
Rel.6	3.43	4.26	-0.83	15
	20.77	**25.97**	**-5.2**	
		Responsiveness		
Res.1	3.36	4.22	-0.86	13
Res.2	3.43	4.292	-0.862	12
Res.3	3.18	4.16	-0.98	5
Res.4	3.16	4.28	-1.11	2
	13.13	16.952	-3.822	
		Assurance		
A.1	3.39	4.27	-0.88	11
A.2	3.46	4.23	-0.77	19
A.3	3.24	4.22	-0.98	6
	10.09	**12.72**	-2.63	
		Empathy		
E.1	3.2	4.26	-1.06	3
E.2	3.177	4.21	-1.033	4
E.3	3.24	4.17	-0.93	8

Dimensions	Perception	Expectation	Unweighted SERVQUAL value	Priority Improvement
E.4	3.38	4.26	-0.88	10
E.5	3.44	4.34	**-0.9**	9
	16.437	**21.24**	-4.803	

From the above table it can be seen, that the biggest negative gap is attributable to accuracy in the procurement of spare parts is whether the customer receives spare parts in accordance with demand or requirement or not, attributes are contained in the dimension Reliability.

Table 3: Weighted Gap Value

Dimensions	Perception	Expectation	Unweighted SERVQUAL Value	Weight	Weighted SERVQUAL Value	Priority Improvement
Tangible						
T1	3.601	4.353	-0.752	0.0378	-0.0284865	22
T2	3.419	4.238	-0.819	0.0398	-0.0326074	16
T3	3.238	4.061	-0.823	0.0340	-0.0279948	24
T4	3.716	4.389	-0.673	0.0385	-0.0259491	25
T5	3.434	4.292	-0.858	0.0378	-0.0325018	17
T6	3.65	4.36	-0.71	0.039	-0.0281716	23
T7	3.65	4.39	-0.74	0.040	-0.0298053	20
	24.708	30.083	-5.375	0.2681	-0.2055168	
Reliability						
Rel.1	3.46	4.28	-0.82	0.0416	-0.0341528	14
Rel.2	3.5	4.27	-0.77	0.0413	-0.0318694	18
Rel.3	3.43	4.36	-0.93	0.0426	-0.0396869	5
Rel.4	3.16	4.28	-1.12	0.0410	-0.0459766	1
Rel.5	3.6	4.34	-0.74	0.0394	-0.0291760	21
Rel.6	3.43	4.26	-0.83	0.0425	-0.0352751	12
	20.77	25.97	**-5.2**	**0.25082**	-0.2180970	
Responsiveness						
Res.1	3.36	4.22	-0.86	0.0393	-0.0338325	15
Res.2	3.16	4.28	-0.1862	0.04181	-0.0360436	9
Res.3	3.18	4.16	-0.98	0.0399	-0.0391405	7
Res.4	3.35	4.46	-1.11	0.0431	-0.043186	2
	13.13	16.952	-3.822	**0.16214**	-0.1549934	
Assurance						
A.1	3.39	4.27	-0.88	0.0419	-0.0368728	8
A.2	3.46	4.23	-0.77	0.0389	-0.0300240	19
A.3	3.24	4.22	-0.98	**0.04045**	-0.0396424	6
	10.09	12.72	-2.63	0.1213	-0.1065393	

Dimensions	Perception	Expectation	Unweighted SERVQUAL Value	Weight	Weighted SERVQUAL Value	Priority Improvement
			Empathy			
E.1	3.2	4.26	-1.06	0.0395	-.0.0348404	13
E.2	3.177	4.21	-1.033	0.0405	-0.0418762	4
E.3	3.24	4.17	-0.93	0.0381	-0.0354989	10
E.4	3.38	4.26	-0.88	**0.0398**	-0.0422434	3
E.5	3.44	4.34	**-0.9**	0.0394	-0.0354844	11

From the above table it can be seen, that the biggest negative gap is in the attribute of accuracy in the delivery of spare parts, and there is in the dimension of reliability. Viewed from the results of table 3, it can be seen that the value of three big gap is on the precision in spare parts delivery is -0.045 and it is in the responsiveness dimension. The speed in receiving the request is -0.043 and is present in the responsiveness dimension. Willing to help 24 hours of -0.041 and there is in dimension empathy.

Based on the survey, the observation of the product in supply has the highest negative gap value, it can be identified waste (waste) that occurs on the accuracy in the procurement of spare parts:

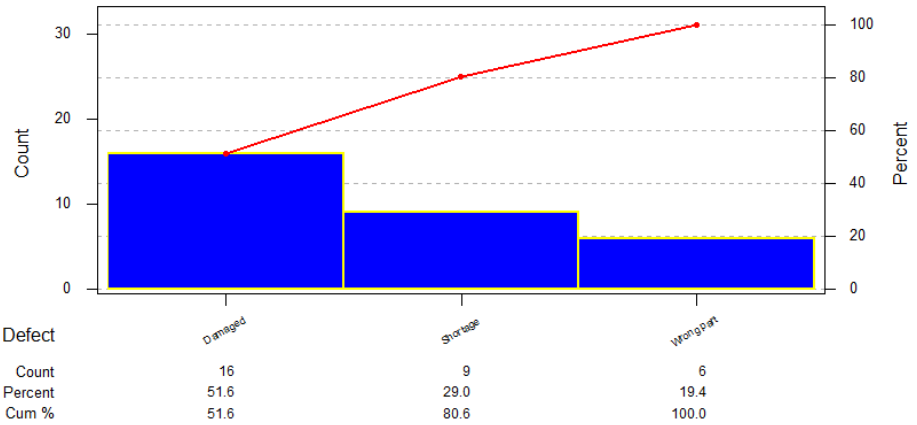
1. Defects: the existence of damaged goods when received by the customer, the quantity of goods came not in accordance with the order, received goods do not match the goods in the message, Paperwork or document errors.
2. Waiting: In waste is happening waiting that happens waiting time between claims with a replacement. For urgent procurement, this will be very detrimental to the customer due to the time wasted to wait for the goods to be supplied.
3. Cost: with the damage of goods or goods mistakes supplied, then there is a loss on both parties either the customer or GE Energy itself.

The customer will experience a delay in the installation schedule which will result in the delay of the machine that should be on. On the GE side, there is a cost to replace the goods as well as the cost of shipment that must be in charge. In this waste identification stage, the largest negative gap values are integrated into the lean method. From the result of SERVQUAL calculation it is found that the biggest negative gap value is on the accuracy in spare parts supply equal to -0,043 and is in reliability dimension. From the interview results can be known the type of waste prioritized to be improved or repair.

Identification of critical to quality (CTQ) is based on the result of the highest importance (highest weight) and the frequency is found that the type of waste occurring in spare parts procurement in GE is the type of waste defect. This type of waste provides an opportunity for consumer dissatisfaction.

The waste that occurs on GE Energy products includes quality issues in terms of procurement of goods where the goods received by customers are not in accordance with what they expect the goods received wrong and damaged.

Figure 1: Defect of Pareto Diagram



Using the ppm and sigma conversion table, the sigma level is known:

Table 4: Relationships Sigma and DPMO

Sigma	Parts per Million
6 Sigma	3,4 defects per million
5 Sigma	233 defects per million
4 Sigma	6.210 defects per million
3 Sigma	66.807 defects per million
2 Sigma	308.537 defects per million
1 Sigma	690.000 defects per million

Analysis of the causes of waste that most affect the quality of procurement of goods. Based on questionnaires and observation results in the field, waste that has the most influence on the procurement process is defect include: goods come with less quantity (shortage), disrepair, not to order (wrong part).

Based on the calculation of customer complaints on GE in the period November 2015 to April 2016 there are 2.93 sigma. Thus, it can be concluded that in the value of sigma of 2.93 means that the service activity is not able to produce the quality of service expected by the customer and should be done immediately. Improvements should be made in the delivery of parts to correct customer complaints. The company can improve the quality of service from the internal company itself is to identify waste which is an activity that is not necessary for the consumer because it has no added value to customer satisfaction.

Table 5: FMEA Analysis on Defect Part

Potential Failure Mode	Potential Failure Effects	Cause	Action Plan for Improvement
Packaging	Product received defects	SOP is not quite right	SOP is fixed
Operator less concentration	Qty of goods entered into the wrong packaging	Work patterns are monotonous	Re-check by QC before packing
Operator lacks knowledge	goods sent wrong	Less training on product	Training is given to each related party
Package labeling	goods sent wrong	system error, SOP less clear	repair system or SOP
Goods do not fit	Item cannot be installed on the machine	Engineering is wrong in identifying the goods to be supplied	checking and final confirmation of goods installed on the machine
The material is fragile	defect when received at the customer's warehouse	inadequate packaging system	SOP and QC should be more tightened

CONCLUSION AND DISCUSSION

To measure the level of service quality by using SERVQUAL method obtained the highest negative gap is accurate in the spare parts supply of -0.045 and is in the reliability dimension. To identify waste by using lean method that happened in spare part supply process. From the results of interviews and analysis of corporate data, obtained type of waste defect is the greatest value where the customer does not get satisfaction. From the type of waste defect is identified critical to quality to calculate the level of performance is converted to sigma value of 2.93 sigma and this sigma value proves that satisfaction does not match with the expected. Once the sigma value is known which is the level of performance, analysis of the causes of defect in the provision of spare parts. To improve or improve, the FMEA method is used to identify potential defects in the supply of spare parts.

Improvement must be immediately applied to ensure that the goods supplied to the customer are received according to the customer's expectation. Perform regular measurements of the quality of service processes to find out what their performance values are and to know what processes do not have added value. Applying the measurement of its performance that is from internal company by applying standardization work made. The purpose of this standardization is to standardize a measurement system that can deliver satisfactory results to consumers. It is good for external consumers as consumers who use the services and for internal customers as employees who work there will be more eager to improve its ability. Furthermore, there will be continuous improvement of each type of problem.

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